

Determination of Emission Factors from Back-Up Generators

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Range of Emissions from Diesel Generators in Current Literature including AP-42

Pollutant	Low Range (lb/MW hr)	High Range (lb/MW hr)
NO _x	5.9	17.1
PM	0.74	3
CO ₂	1482	1700
CO	7.6	30
VOC	0.73	2
SO ₂	0.3	0.5



BUGS used to develop emission rate estimates

Location	Make	Model	VIN/Serial #	Generator Type	Max Power kW
Johnson Mach	CAT 3412C	3412 C	BPG00177	Primary	545
VAFB	CAT 3406C	3406 C	4RG01632	Backup	300
VAFB	DETROIT 92	80837405	BVF149700	Backup	350
SB University	CAT 3406C	3406 C	4JK00753	Primary	350
Johnson 340xx 350	CAT 3406	3406 C	4JK00706	Primary	350



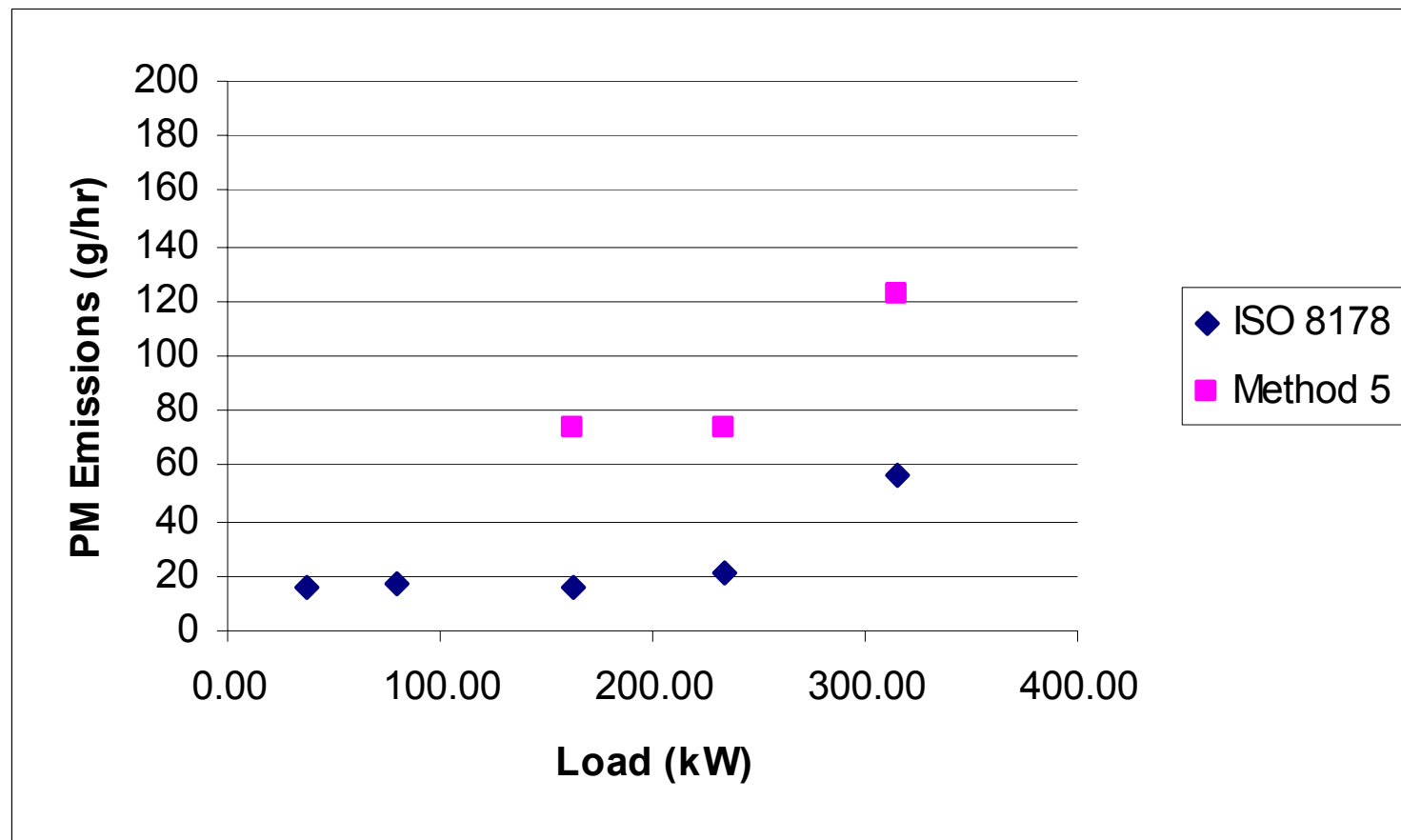
Emissions Analyzed as a Function of:

- BUG model
- BUG Size
- Operating Load
- Measurement Method

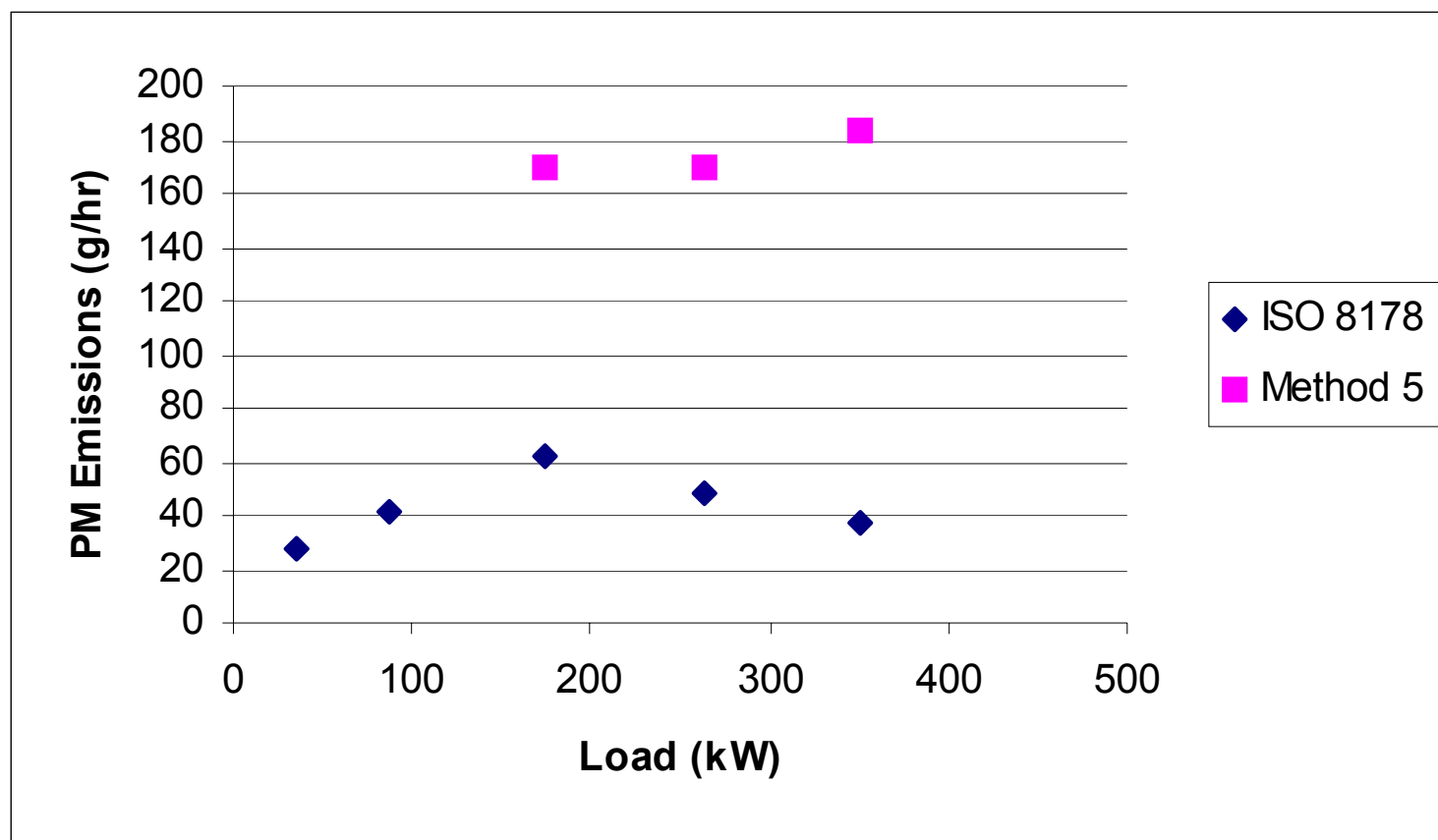
With the exception of the 2-stroke model, the model and the size of the 5 BUGS tested did not show significant effects on emission rates



Measurement Method Comparison for 4 stroke Diesel Generators



Measurement Method Comparison for 2 stroke Diesel Generators



Emission Results

The next figures show the emissions results of the five BUGS tested as a function of load on the generator for the ISO 8178 testing method. The best fit for all pollutants was determined to be in the form of a linear equation:

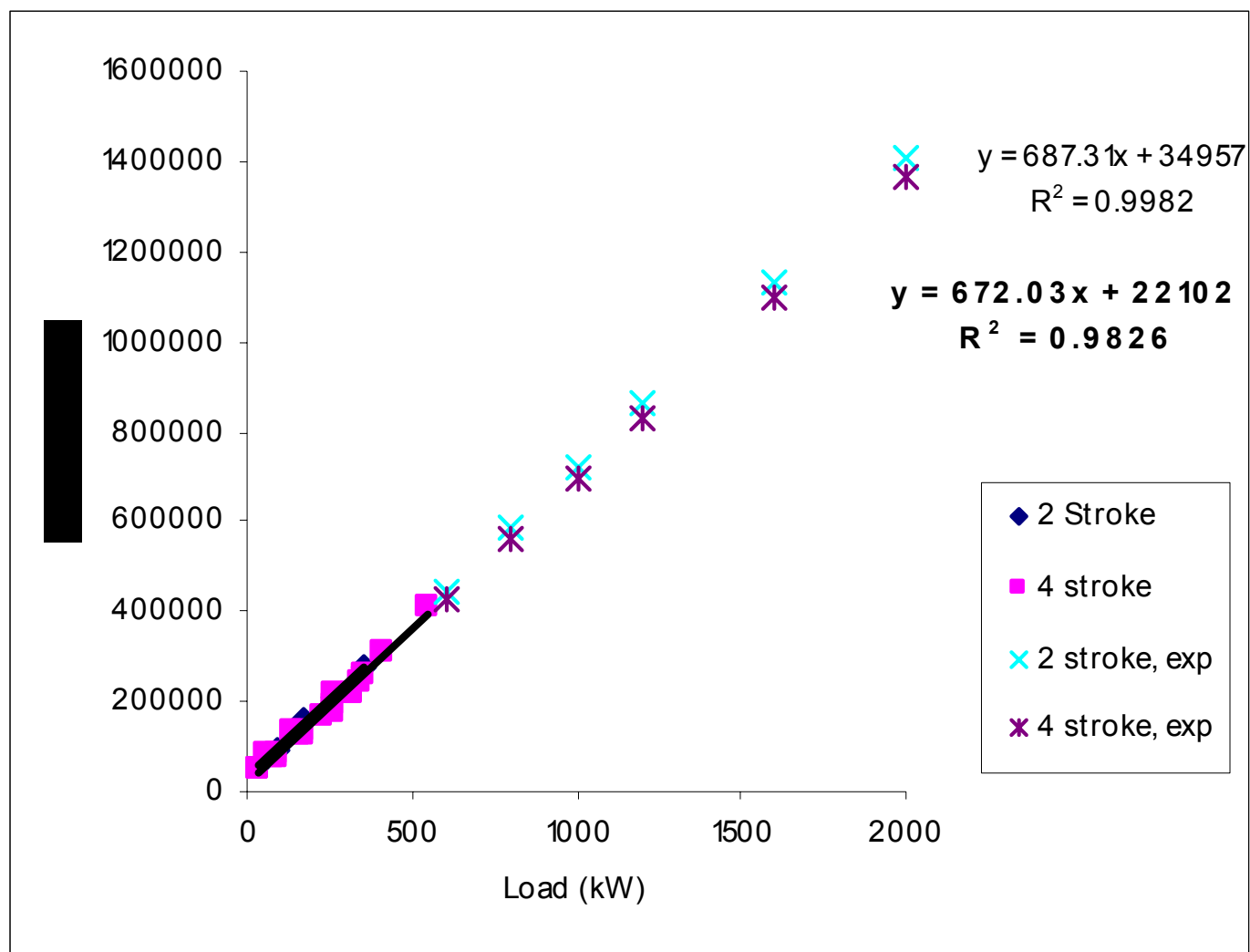
$$\text{Emission Rate (g/hr)} = b * x + c$$

where x = operating load in kW

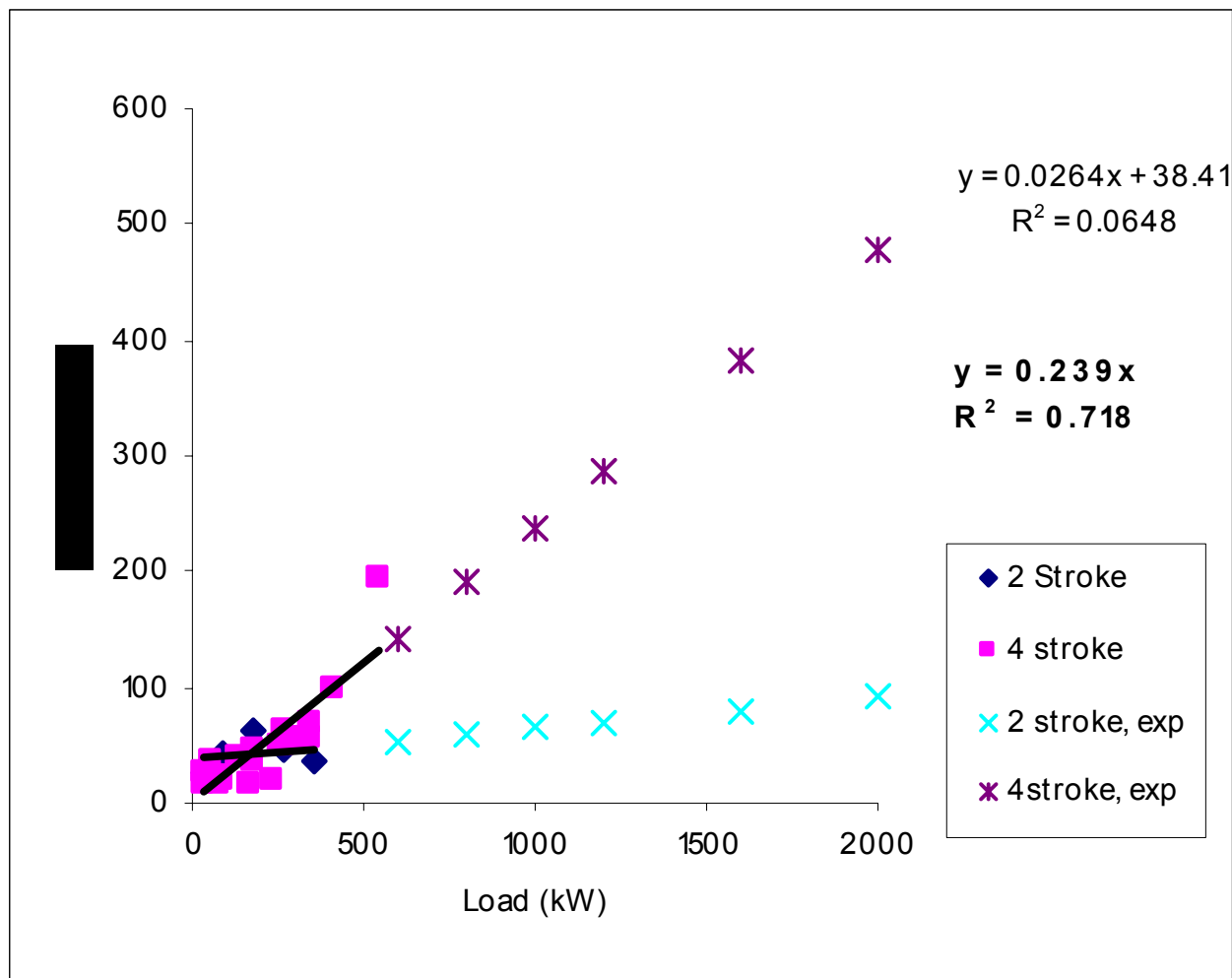
b, c = constants for each pollutant



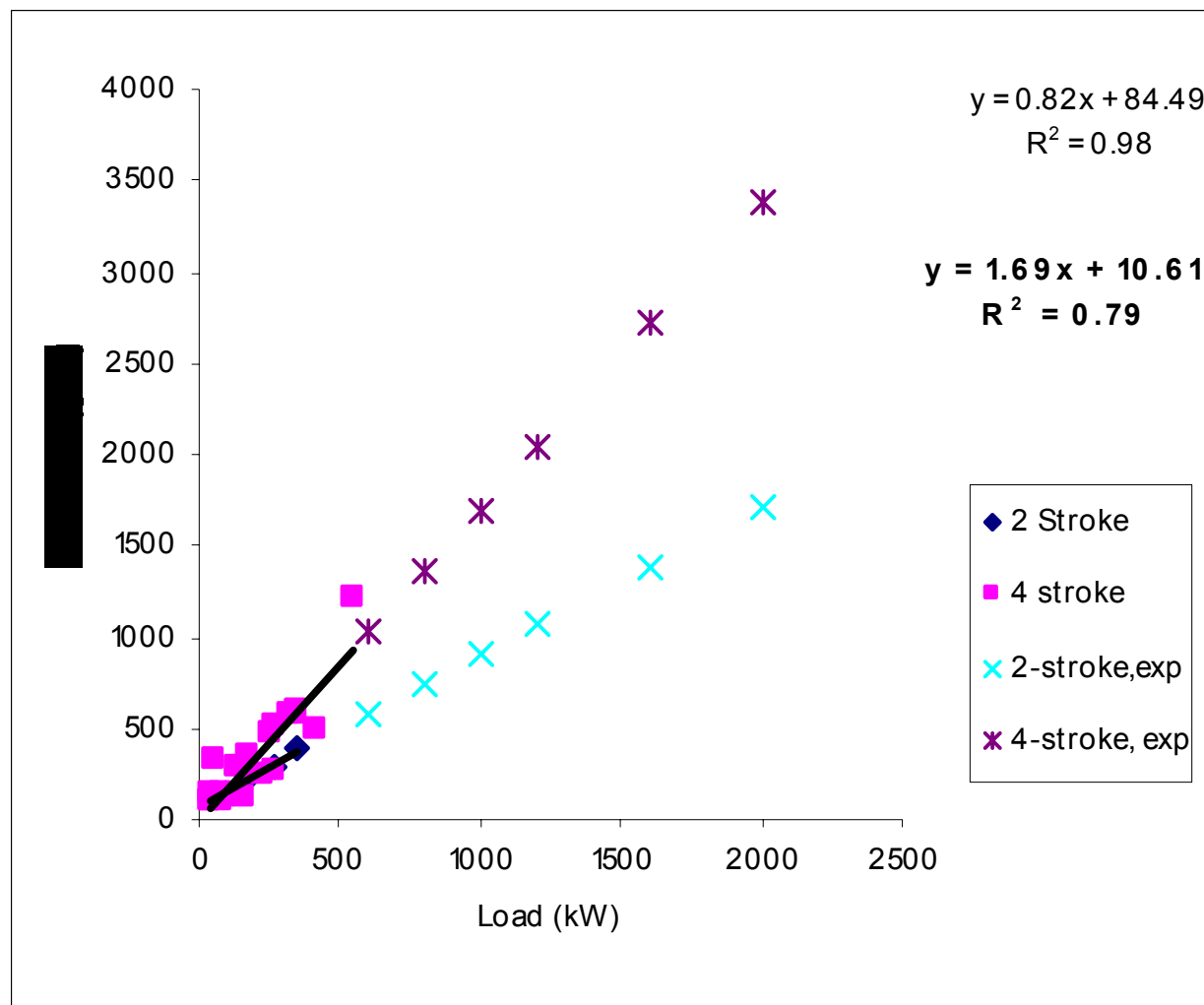
CO2 Emissions for Diesel Generators



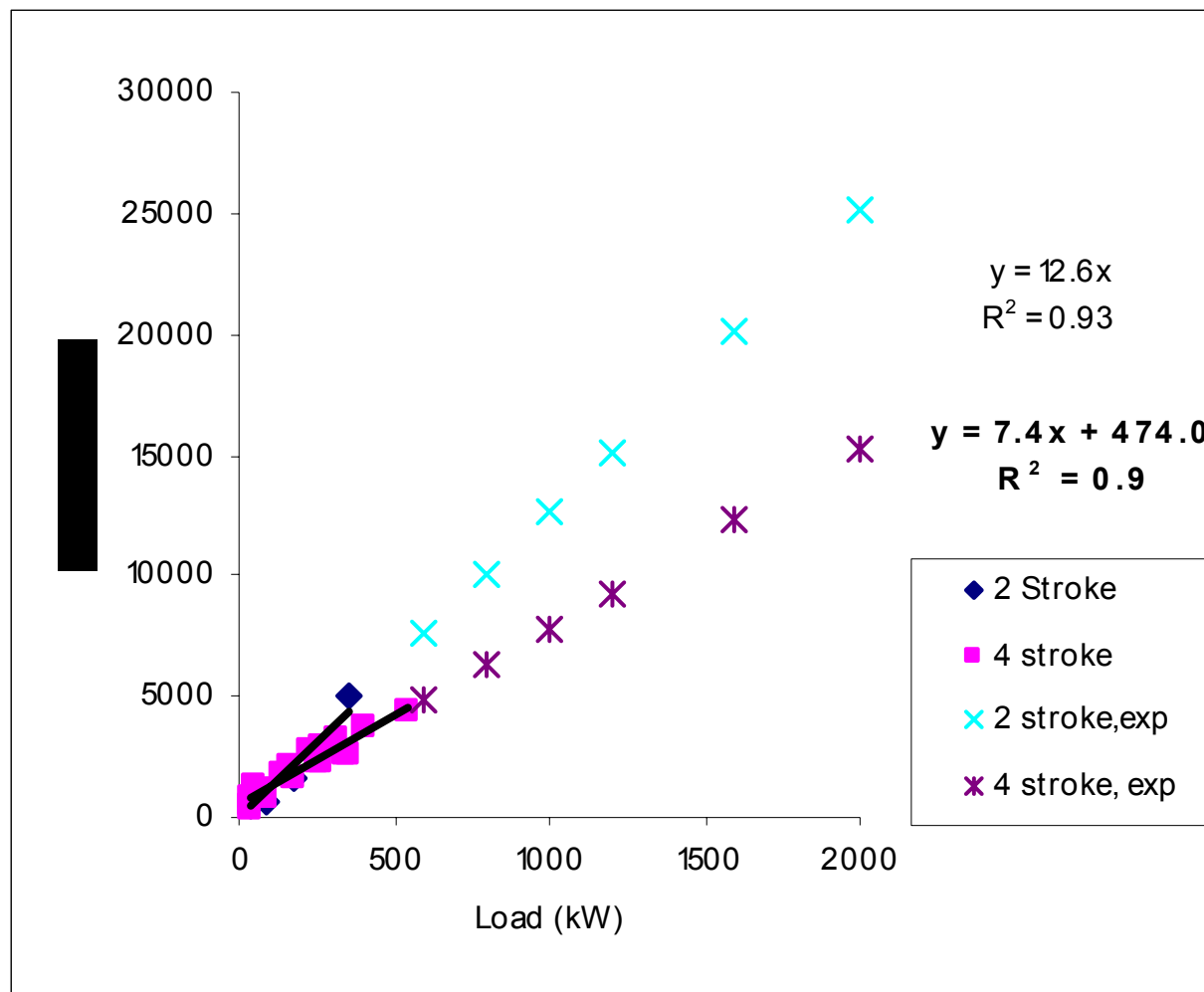
Total PM Emissions for Diesel Generators



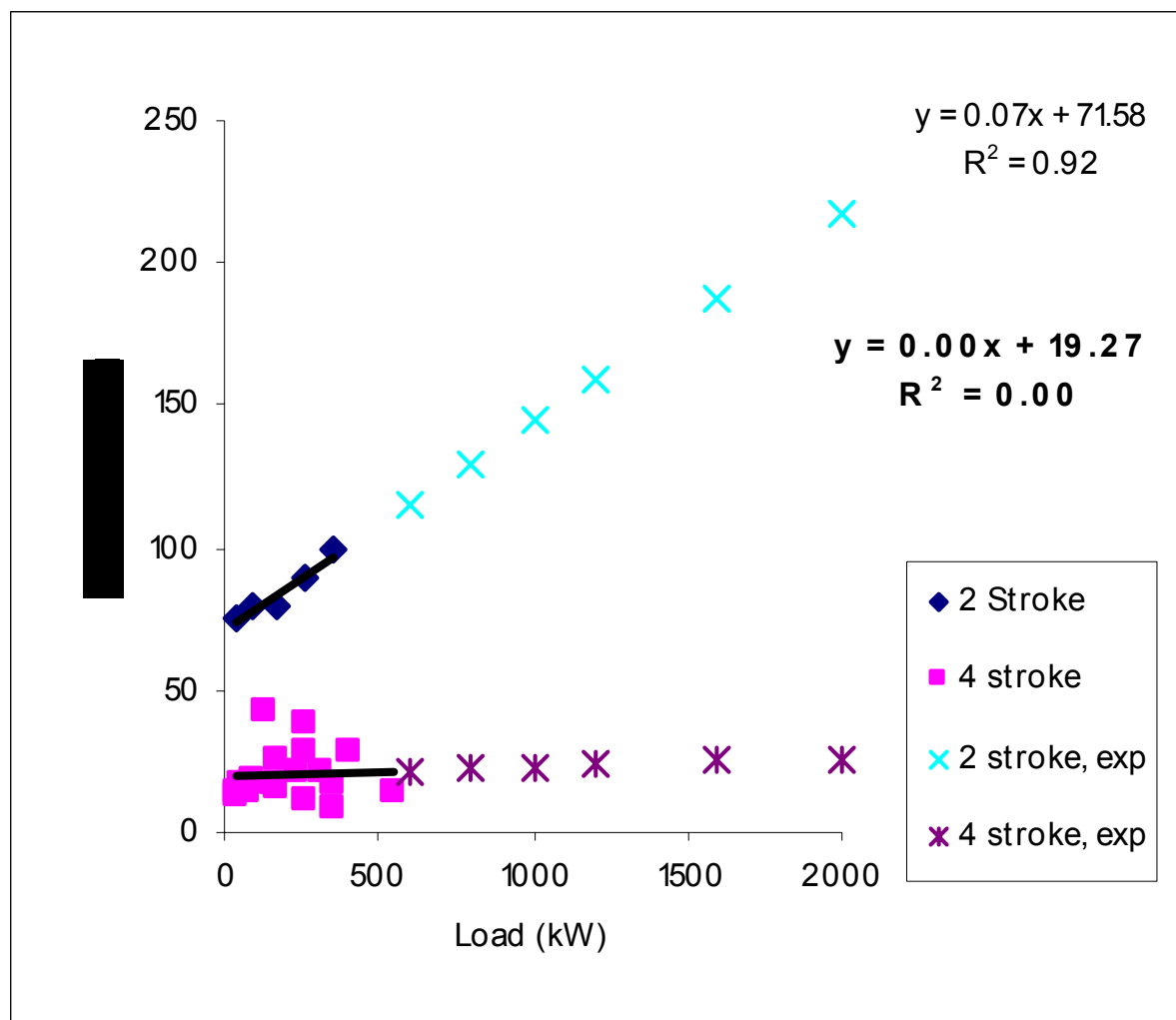
CO Emissions for Diesel Generators



NO_x Emissions from Diesel Generators



VOC Emissions from Diesel Generators



Emission Factors Developed

- The emissions used in this report were limited to the values using the approved ISO 8178 method for 4 strokes only, since the vast majority of the BUGS in the inventory are 4 strokes

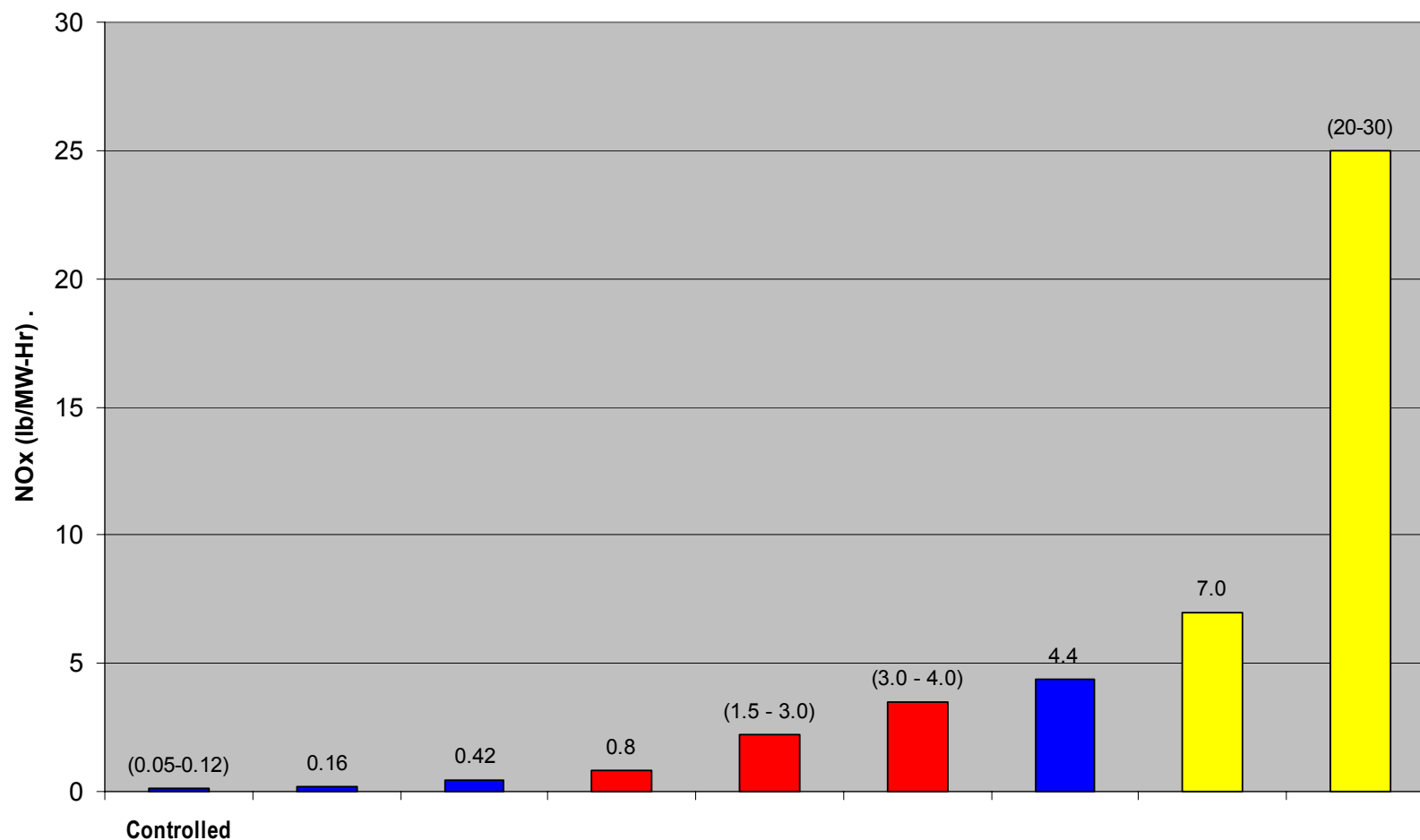


Summary of Emissions from 4 Stroke Diesel Generators Used in Air Quality Modeling

Load	VOC	THC	CH ₄	CO	NO _x	CO ₂	PM
KW	lb/MWh	lb/MWh	lb/MWh	lb/MWh	lb/MWh	lb/MWh	lb/MWh
100	0.463	0.546	0.088	4.51	26.54	2003.01	0.457
200	0.249	0.282	0.062	3.70	21.64	1715.34	0.457
300	0.177	0.193	0.053	3.43	20.00	1619.45	0.457
400	0.142	0.149	0.049	3.29	19.19	1571.50	0.457
500	0.120	0.123	0.046	3.21	18.70	1542.74	0.457
600	0.106	0.105	0.044	3.16	18.37	1523.56	0.457
800	0.088	0.083	0.042	3.09	17.96	1499.59	0.457
1000	0.077	0.070	0.041	3.05	17.72	1485.20	0.457
1200	0.070	0.061	0.040	3.02	17.55	1475.61	0.457
1600	0.061	0.050	0.039	2.99	17.35	1463.63	0.457
2000	0.056	0.043	0.038	2.97	17.23	1456.44	0.457



Comparison of Emissions from Power Generation Units



AQMP NO_x Data for the Year 2000

Total Stationary Sources = 113 tons per day

Total Mobile Sources = 769 tons per day

Total = 882 tons per day

Potential NO_x from Emergency Backup
Generators = **26 tons per hour.**

